AN EARLY TERTIARY RELICT IN MALAYA, EUPHORBIA RIDLEYI nom. nov., descr. emend. (E. SYNADENIUM RIDL.) AND ITS POSITION IN THE LINNEAN GENUS.

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A singular *Euphorbia* was presented by Ridley (Journ. Roy. As. Soc., Str. Br., No. 61 : 36, 1912) as follows :—

> "*Euphorbia Synadenium* n. sp. A shrub about 2 feet tall, stem smooth brownish rather succulent. Leaves alternate oblanceolate spatulate subacute or blunt narrowed to the petiole fleshy, green, nerves invisible, 4 inches long 1½ inch wide, petiole ½ inch long. Inflorescence solitary or in pairs 1 male and 1 female axillary. Male, peduncle ⅛ inch long thick with two short ovate bracts purple pink. Involucre as long as pink lobes 5 thick semiorbicular light green punctate. Glands separate truncate oblong narrowed at the base, apex laciniate pink ten. Flowers numerous. Stamens solitary, filament thickened at the base above filiform surrounded by a fimbriate calyx of narrow white linear lobes about 8, anther cells globose separate. Female involucre smaller subangled with 2 dark pink lobes much shorter not expanded greenish yellow, glands flat incurved laciniate pale green. Pistil solitary surrounded with pale green laciniate calyx, overy subglobose shortly stalked. Styles three subulate not plumed twisted together.
>
> Penang Hill : near the Waterfall : Selangor : Langat.
>
> In rocky woods. I have this curious plant in cultivation in the Botanic Gardens in Singapore.
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> Baillon described a species of *Synadenium* as *Euphorbia Synadenia* but this has been referred to its genus *Synadenium*, so that the above name will stand."

The description, no doubt, suffers on account of careless typesetting. A carefully edited rearrangement of it (Fl. Mal. Pen., 3 : 180–181, 1924), however, is barely more intelligible to the average taxonomist; the revised description is as follows :—

> "*E. synadenium* Shrub about 2 ft. tall. Branches rather succulent, brown. Leaves alternate oblanceolate spathulate sub-acute or blunt, fleshy dark green : nerves invisible; 4 in. long, 1.5 in wide; petioles 5 in long. Involucres solitary unisexual. Male on a peduncle .12 in. long with 2 ovate purple-pink bracts; involucre pink, lobes thick semiorbicular, green. Glands 10 truncate oblong laciniate pink. Stamens

solitary surrounded by a calyx of about 8 white linear lobes. Female involucre smaller with 2 pink lobes, glands flat incurved green. Pistil surrounded by a laciniate green calyx. Ovary subglobose stipitate. Styles 3 subulate. Hab. rocky woods, local, Selangor, Langat (Ridley). Penang Hill near the waterfall (Curtis, Ridley) Native name: *Poko Sesudu Bukit*. I have only seen this plant about 2 ft. tall. Mohammed Haniff reports it as growing to 6 to 8 ft."

In both accounts the terminology is Ridley's own and highly unconventional. So much, of course, does not in itself call for comment or censure, but any one familiar with the genus is puzzled by the mention of 10 glands and of 8 lobes that occurs in the later version. Not only in the species, as described, are the glands twice as many as usual: the apparent quinary symmetry of the cyathium itself is denied. The letter of the document reveals *E. Synadenium* either as not less extraordinary a form than *E. pedilanthoides*, or a downright pathologic case.

Before investigating the species, it is necessary to establish its correct name according to the present Rules of botanical nomenclature. In his original publication, Ridley practically admitted that his name *E. Synadenium* (which clearly referred to the genus Synadenium) was homonymous with *E. Synadenia* Baillon. At that time, it was still customary among many European botanists to regard such a homonym as valid, if the earlier name, as in this case, was transferred to another genus. By the recent change in the Rules of botanical nomenclature, however, all later homonyms are invalid. Ridley's name can therefore stand only if we regard it as distinct from *E. Synadenia*. This raises the nice question of what differences may be admitted as constituting distinct names, and conversely. The Rules are decidedly vague on this matter, but in view of Ridley's tacit admission, and of the fact that the two names can legitimately be regarded as of different gender only, it appears right to regard them as identical. A new name is therefore needed, and is given below. It may also be mentioned that Boissier mistranscribed Baillon's name as *E. Synadenium* in the synonymy of *Synadenium arborescens* (D.C. XV: 1269, 1866); but by Art. 40 of the Rules such a synonym has no validity as a published name. The loss of the name *Synadenium* for the present species is not to be regretted, as the "glands" are far from connate.

The writer stands under deep obligation to Mr. Holttum who kindly consented to send on loan the material preserved in the herbarium of the Botanic Gardens of Singapore (No. 1199, VII. 13. 1916, leg. Mohammed Haniff; s.n., III. 6. 1926, leg. E. Seimund) and arranged for the transmission of live rooted cuttings and detached cyathia in fluid. The description to follow, unfortunately, is still short of the data from the ♀ cyathium, although a nearly ripe capsule is recorded.

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E. Ridleyi nom. nov., descr. emend.—Leaves alternate, crowded at the tip of carnose slender twigs, glabrous, up to 21 cm. long, 7 cm. broad; blade oblanceolate to subelliptic, very entire, occasionally sublobate (1 lobule seen on 1 leaf), more or less deeply notched at the rounded apex, when dried thickened at the margin and smooth or obscurely and irregularly veined beneath, mostly tapering from the upper third or fourth to a distinct roundish subwinged petiole up to 3½ cm. long; midrib conspicuous beneath canaliculate above ending in a short stiff deciduous mucro; leaf-stipules 2, minute carnose, irregularly conic, grooved, persisting or not at the slightly upraised leaf-scars. Inflorescence strictly axillary of 1–2 (and more?) variously arranged cymes, mostly bistipulate at base, up to 2.5 cm. long; cyathia unisexual, clustering, on monocephalous short peduncles about 2 mm. long, or single on a peduncle 6 mm. long extended beyond a pair of minute bracts into a pedicel 8 mm. long, or in pairs on a common peduncle 5 mm. long and individual pedicels up to 7 mm. long. Cyme-bracts opposite, free or subconnate at base, carnosule, subquadrangular to broad ovate, mostly apiculate, to 3 mm. long. Cyathium (only ♂ seen in fluid and dissected) up to 11 mm. wide with a very shallow involucre and manifestly deflected (at ca. 45°) nectaria [glands], these about as broad as the involucre itself is deep; cyathium-bracts 2–3 spirally ascending or subopposite, clasping, occasionally exceeding the cyathium, carnose, broad ovate to round triangular, apiculate or entire at apex, keeled or rounded on back, up to 4 mm. long and broad; nectaria [glands] 4 – 5, contiguous, quadrangular to elliptic, rugulose pitted, shallowly and irregularly crenate at margin, 5–6 mm. long, 3–3½ mm. wide; lobes 4–5 elliptic, denticulate 3 mm. long, 2 mm. wide; ♂ flowers [stamens] numerous in (4–) 5 fascicles; staminodes very numerous, carnosule, spatulate, laciniate cleft, to 4 mm. long. Capsule glabrous, smooth or rugulose, 1.3 cm. wide, 8 mm. long. exserted on a thin stipe 8 mm. long; cocci 3, often unequally developed, discrete, the rounded keel becoming more or less thin-acute towards the recurved end; calyculus irregularly 3–5 lobulate, scarcely 3 mm. broad; styles 3, cleft to base, subulate, entire, spreading. Seed not seen.(1)

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(1) *E. Ridleyi* nom. nov., descr. emend. (*E. Synadenium* Ridl., nec Boiss. (sphalm. Baill.)) Frutex diffusus 2–8 ped. altus, ramulis succulentioribus ultimis crassitie calami scriptorii. Foliis alternis subverticillatis carnosis glabris, ad 21 cm. longis, 7 cm. latis, apice rotundatis, oblanceolatis subellipticisve, rarissime sublobatis, emarginatis; petiolo ad 3½ cm. longo; stipulis petiolaribus binis subconicis rimosis minutis deciduis vel ad folii cicatricem subelatiorem persistentibus. Cymis axillaribus ad 2.5 cm. altis; cyathiis monosexualibus pedunculatis pedicellatisve ad 11 mm. latis; nectariis 4–5 contiguis foveolatis, ad 45° deflexis, involucri ambitum aequantibus; lobis 4–5 ellipticis, denticulatis, 3 mm. longis, 2 mm. latis: staminibus multis (4–) 5-fasciculatis; staminodiis plurimis; capsula exserta stipitata ad 1.3 cm. lata; coccis 3, discretis recurvis; calyculo 3–5 lobulato; stylis 3, partitis, subulatis intergris. Semina desiderantur.

Loc.: Penang Hill, near the Waterfall: Selangor, Langat (Ridley). Pulau Rumbia (specimen). An indication that the range might tend to become more circumscribed is apparently given in a note from Mr. Holttum (*in litt.* Aug. 1935) mentioning that the plant was not found at an easy accessible former habitat at Penang, although it was still being reported from the south of Penang Island.

The habit is described as follows by Mr. Holttum (*in litt.*, Febr. 1936) "I recently saw an old plant of the species in Penang; it was scrambling over a large rock in half shade and had reached a considerable length, though the stem was still quite slender". This peculiar habit is observed in several Mexican and Tropical American species.

Plainly interpreted *E. Ridleyi* is a form less remarkable in itself than Ridley's diagnosis suggests. Truly remarkable, however, is this species in floristic and in phytogeography.

The understanding of *Euphorbia* at this hour is still fundamentally what it was in the days of Linnæus. In the opinion of the writer the "genus" is a threadbare net of diverse evolutive phyla artificially connected by a common type of inflorescence (cyathium) which the Linnaean understanding consciously or unconsciously treats as a flower. The sections which attempt to present the countless species of *Euphorbia* as a rational whole use in the majority of the cases imperfect concepts, and uncritically accepted are an hindrance rather than a help to study. The fact that N. E. Brown who enjoyed unsurpassed facilities for studying the Linnæan genus disregards sections altogether in his classic works may be invoked to absolve the writer from the duty of proving his statements at this hour. It is plainly not advisable to abound in citations of modern works which, *e.g.*, introduce sect. *Tenellæ* in the Gangetic peninsula in the wake of *E. dracuncoloides*, or very nearly propose a new section on the strength of the digitate nectaria of *E. clavidigitata* from Burma. For the purpose at hand the sections of Hooker (Fl. Brit. Ind. V: 245–246, 1890) are as good as any.

Hooker accepts (o.c., l.c.):

Sect. I.—*Anisophyllum* with subss. *Elegantes*, *Hypericifoliæ*, *Chamæsyceæ*.

Sect. II.—*Euphorbium* with subss. *Tirucalli*, *Dicanthium*, *Rhizanthium*.

Sect. III.—*Tithymalus* with subss. *Galarhæus*, *Esula*.

The principles of a sound classification of the Linnæan genus were perfectly understood by Roeper (En. Euph., 1824), who emphasized the faculty peculiarly inherent to *Euphorbia* to suppress and to shorten axes (o.c., 28 *et passim*). It may be that the Enumeratio Euphorbiarum is a juvenile work weak in taxonomic understanding: the fact stands that Roeper had a sounder grasp of the *nature* of *Euphorbia* than Boissier and other well-known botanists, and one may regret that Roeper failed to present the monograph of the genus on which he was known to work (Ch. des Moulins in notes to *E. Milii,* Bull. Hist. Nat. Soc. Linn. Bordeaux I: 27, 1826).

Judged as *natural* groups in the light of Roeper's basic premises *Anisophyllum* and *Tithymalus* have a value that beyond comparison exceeds that of *Euphorbium*. In *Anisophyllum* the main axis aborts immediately above the first pair of leaves, and, therefore, may be technically described as indefinite. The species of the section are all harmonious in the sense of evolution: their development can take place only from buds in the aborted main axis, which simple fact accounts for their axial arrangement, habit and interpetiolar stipules. In *Tithymalus* the main axis develops and is definite, to say ends with a terminal cyathium. The sections lacks stipules and has fundamentally alternate leaves at the axes that are not immediately flower-bearing. Any one who has worked with *Euphorbia* recognizes *Anisophyllum* and *Tithymalus* at sight, for, it has been noticed, they are *natural* groups. The subsections need not be discussed at present.

Euphorbium covers *Tirucalli, Diacanthium, Rhizantium.* The last may be disregarded here. It probably includes regressive and depauperate forms, or highly specialized species from different evolutive phyla and, appearances to the contrary, has never been fully explored. *Tirucalli* has axes that are definite precisely as are those of *Tithymalus*. The main stem evolves freely and the floriferous axes end with a cyathium surrounded by a pseudo-umbel of more or less long-pedunculate and long-pedicelled cyathia. The fact that some species of the *Tirucalli* of common understanding have stipulate leaves may not be discussed even briefly at this hour: suffice it to establish that *Tithymalus* and *Tirucalli,* naturally interpreted, stand on the same phylogenetic and systematic line. *Diacanthium* abhors *Tirucalli.* Its axes are indefinite, not carrying true terminal cymes (pseudo-umbels). Its prickles are spinescent aborted axes prescisely matching those observed in *Rosaceæ, Rhamnaceæ, Rutaceæ,* etc., and not relicts from a ternate foliar verticil or from lobes and auricles at the base of the blade. In brief: *Tirucalli* and *Diacanthium* are "classified" under one section for no better reason than their being succulent.(1)

Concluding: *E. Ridleyi* can not be a *Tithymalus, a Diacanthium* or a *Tirucalli,* and still less an *Euphorbium* which *sectio ineptissima* is wholly an horticultural figment. *E. Ridleyi* naturally falls in with certain species of sect. *Goniostema,* a section which so far has not been known to exist in Asia.

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(1) The issues that here must be briefly outlined in order to define the position of *E. Ridleyi* will be treated in detail in a coming publication.

The *Goniostema* species with which *E. Ridleyi* has affinity are those that Boissier describes (D. C. Prodr. XV 2 : 77, 1862) as having *stipulas indivisas* (typ. *E. pyrifolia*). The species which Boissier lists *stipulis verticalibus cristæformibus* (o.c., 78; typ. *E. leuconeura*) have nothing to do with the true *Goniostema,* Their affinities wholly lie in the direction of the group represented by the so-called *E. splendens*(1). Denis correctly shifts them (Euph. II. Austr. Afr., 72, 1921) there, unfortunately, however, offsetting this pertinent change with the inclusion of *E. orthoclada* under *Goniostema. E. orthoclada* has definite axes and pseudoumbels, and belongs with *Tithymalus.*

Compared with the species of *Euphorbia* of the Malaysian, Indochinese and Australasian domain *E. Ridleyi* is found naturally to agree only with *E. epiphylloides,* an endemic of the Amdaman Islands (v.v.) which has no place with the *Tirucalli* species among which it has so far been listed. The peculiar flattened stems of *E. epiphylloides* do not alter the basic characters of inflorescence, leaf-stipule and habit, *sensu lato,* that make of it an outspoken *Goniostema. E. plumerioides* with range from the Philippines to Java belongs to *Tithymalus.* Two species respectively from the Straits of Torres and from Queensland and New Zealand, *E. corynoclada* and *E. glauca* abhor *E. Ridleyi.* The former, as Manson Bailey appears to claim correctly (Queensl. Fl., V : 1400, 1902) is close to *E. aphylla* which is a Canarian endemic of the *Tirucalli* description. The latter is a strand-species which is similar to the *Euphorbia* species from the Macaronesian domain included by Boissier in *Tithymalus* subs. *Pachycladæ.*

There is a bare possibility that *E. Ridleyi* is allied with *E. Cleopatra* (n.v.), from New Caledonia. This island, and its archipelago, are a domain of extraordinary interest for the student of *Euphorbiaceæ.* Regardless, however, of a possible connection with *E. Cleopatra* the affinities of *E. Ridleyi* are in the direction of species from Madagascar and the groups of islands in the Indian Ocean. Thus *E. Ridleyi* and *E. epiphylloides* stand at the eastern, *E. pyrifolia* at the western pillar of a collapsed bridge : they brood over a continent that has been engulfed by the Indian Ocean. In the truest sense of the word they are relicts, which is it proper to designate as Gondwanic relicts.

Gondwanaland up to the beginning of Tertiary times connected Africa with Malaysia and Australia, and sound evidence has been unearthed to the effect that at the same time or shortly before Africa was connected with America (1). Under the standpoint of palaeogeography a relationship between the life-forms of Madagascar and Malaysia, at least as far east as the Wallace's Line, is not only posible but probable. Botanically the evidence in favour of such connection is quite strong. Only to mention one family, *Euphorbiaceæ,* have identic genera in Tropical America and in Africa (cfr. Lanjouw, Euph. Surin., 79–84, 1931). The connection established between the Malagasy and the Malaysian domain by the species of sect. *Goniostema* has just been recorded. Merrill pointedly remarks (Ess. Geob., 247, 1936) that the flora of Polynesia is essentially Malaysian. The same phyla have "tapered" to closely allied genera in distant continents (cfr. *Richeria* and *Richeriella; Baccaurea* and *Aporosella*). The phylum of *Euphorbiaceæ* is not holartic: it harks back, it seems, to forms the beginning of which must be sought at the Permo-Carboniferous glaciation, and its axis of migration is roughly parallel to the equator of to-day in a west-to-east direction. The migration of the holartic phyla is roughly perpendicular to the equator, and confusion need not be made between the two main streams of diffusion of plant-life.

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(1) Bojer's binomial, *ex* Hooker, owes its success to the circulation of pl. 2902, Bot. Mag. 1829, but loses precedence to *E. Milii* Ch. d. Moul., Bull. Hist. Nat. Soc. Linn. Bordeaux, I : 27–30, *cum ic.* 1 *e.* 1826. Des Moulins' binomial is far from being the *nomen nudum* which it is generally supposed to be.

The persistency of isolated species at extreme points of a geologic plant-domain is not surprising. Van Steenis remarks (Bull. Jard. Bot. Buitenz. XIII : 393, 1935) that Malaysia from the Cretaceous on has practically always been wholly within the tropical zone. In contrast to the widespread assumption life does not *naturally* exhibit an aptitude to change. It reacts against the forces in the ambient, and ultimately dies or migrates or is transformed when the pressure of the ambient becomes too strong. It would seem, lastly, that the more a plant-group has been capable of changing in the past the more it is apt to change in the future. *E. Ridleyi* is an archetype lingering in a favoured area, which is matched by *E. epiphylloides* and, if the writer be correct, by certain genera of Malaysian ferns. It is curious to notice that an analogy appears to exist between the rhythm of plant-life at one hand and the laws of motion at the other.

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(1) The bibliography on this subject vastly exceeds the limit of space allowed to these cursory notes. The reader may consult Th. ARLDT, Handbuch der Paläogeographie, 2 vols., 1919–1922; J. W. GREGORY, The Rift Valleys and the Geology of South Africa, 1921; A. P. COLEMAN, Ice Ages Recent and Ancient, 1926; A. DE TOIT, Geology of South Africa, 1926; (T. H. GOODSPEED, edit.) Essays in Geobotany in honor of W. A. SETCHELL, 1936. A masterful study on polar shifts is D. BLACK'S, Palaeogeography and Polar Shift, Bull. Geol. Soc. China, X, 1931.